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Abstract

This paper introduces credit market imperfections and barriers to entrepreneurship into the Ramsey growth model. It is assumed that only a small elite, the oligarchs, may run firms and that these oligarchs - when borrowing from workers - may renege on the debt contracts at low cost. In such an economy, poor contract enforcement slows down the transition towards the steady state and alters the dynamics of the distribution strongly in favor of the oligarchs. The reason is that the workers are forced to charge "low" borrowing rates in order to decrease the incumbents' incentives to default. With *dynastic preferences*, low returns reduce the workers' propensity to save; they discount future wages less and consume more out of current income. Calibrations of the model suggest that the elite's welfare gains are large - even if the oligarchic structure were associated with substantially lower productivity growth rates. These findings point to political forces behind low financial development.

JEL classification: O11, O16, K42

Keywords: creditor rights, asset distribution, economic development

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1 Introduction

Recently, macroeconomists have shown considerable interest in the effect of an imperfect credit market on the long-run distribution of wealth (e.g., Piketty, 1997; Matsuyama, 2000) and on the economy's growth rate (e.g., Bénabou, 1996). While the models contributing to this literature differ from each other in several dimensions, they share one common feature. In each period, the individuals consume a constant fraction out of their current income. Such an *ad-hoc* consumption rule can be optimal if, for instance, a time period is interpreted as exactly one generation and individuals derive utility from consumption and bequest to the offspring. In this paper, we analyze the impact of credit market imperfections when parents take account of the *welfare* of their children. Then, as shown by Barro (1974), individuals with finite lives behave as a household with an infinite horizon so that today's optimal consumption depends not only on current income but also on future returns to accumulation and future wage rates.

To understand the role of an imperfect credit market when the individuals have an infinite horizon, consider the following stylized economy with two key features. First, to keep the analysis tractable, only a small economic elite, the "oligarchs," may run firms in the capital-intensive sector of the economy. Entry from non-members - we will denote them by "workers" - is de facto prohibited because of, for instance, costly licensing of new business. Hence, as far as the workers accumulate capital, they have to lend to oligarchs in order to earn a positive return on their savings. Second, the credit market is imperfect in the sense that the borrowers can only borrow up to a finite amount at a given rate. The credit limit exists because credit contracts are not well enforced; the sanctions against default by oligarchs are imperfect.

An important implication of these two assumptions is that the equilibrium borrowing rate lies below the marginal product of capital if the workers posses relatively much capital. The reason is that a lower borrowing rate gives the oligarchs weaker incentives to default and increases their borrowing capacity. A large borrowing capacity allows the oligarchs to absorb the comparatively high credit supply by the workers; the latter, in turn, are prepared to lend at a low rate because of the lack of an alternative use for their savings. Hence, in such a situation, there is a *spread* between the workers' and the oligarchs' return to accumulation. While the workers experience a low return, the oligarchs - having access to cheap credit - face one that is higher than the marginal product of capital.

The fact that the workers' return may be "very low" generates a number of interesting *comparative-dynamic* results when individuals have dynastic preferences. First, the aggregate capital stock is always smaller than in an otherwise identical first-best Ramsey economy that starts with the same initial conditions. In other terms, given the aggregate capital stock, the oligarchic economy grows more slowly at any point in time than the corresponding first-best Ramsey economy. Second, the distribution of capital and current income is always more uneven (as compared to the first-best economy) in the sense that the workers' share in aggregate capital or income is lower. The equalizing force generating over time a more even distribution in the standard Ramsey world is dampened or entirely eliminated. Moreover, the steady state distribution is the less equal the lower the degree of contract enforcement is. Third, the oligarchic economy has a less developed credit market than the first-best economy if development is measured by the ratio aggregate credit divided by GDP. Poor contract enforcement keeps or concentrates capital in the hands of those who may invest - and prevents the potential lenders from saving much.

The mechanism behind these results is very intuitive. Low future returns to accumulation increase, other things equal, the present value of labor income. With dynastic preferences, current consumption rises in this variable. Hence, the workers' propensity to save out of current income is comparatively low with imperfect contract enforcement. Put differently, the workers anticipate that they will be partially expropriated through low returns if they accumulate too much. Therefore, they do *not* accumulate much; they simply consume a large fraction out of their current income - and remain poor. Note that such a mechanism is absent by construction if the individuals follow the above-mentioned ad-hoc consumption rule (as it is typically the case in the literature) and/or if the interest rate is exogenous (as, for instance, in Banerjee and Newman, 1993; Galor and Zeira, 1993, or Matsuyama, 2003).

It is further interesting to assess the *welfare consequences* poor creditor protection. Despite the fact that the economy grows at a lower rate, the oligarchs are strictly better off than in the corresponding first-best Ramsey economy. The reason is twofold. One the one hand, they win because of "cheap" access to credit. On the other hand, they are better off since capital, their sole source of income, is "scarcer" on the aggregate level at any point in time so that their return to capital is higher. In contrast, the workers lose; they are not only hurt by the low borrowing rates but also by the fact that the wages rise more slowly if the economy grows at a lower pace. Of course, it has already been recognized in the literature that poor contract enforcement, if accompanied by barriers to entry, may benefit the established entrepreneurs through low factor prices; in Banerjee and Newman (1993), for instance, the elite wins because of low wage rates while redistribution operates through low borrowing rates in Matsuyama (2000).[1] However, this paper draws attention on the fact that the elite's welfare gains are very significant if the individuals have dynastic preferences; the reason is that the active generation does not only take into account the current income gains but also the benefits that will accrue to all future generations. Calibrations of the model suggest that the oligarchs would be prepared to accept substantially lower (exogenous) productivity growth rates in exchange for such "bad" institutional arrangements. In other terms, the net benefit would even be positive if the combination of a malfunctioning legal system and barriers to entry caused substantial inefficiencies resulting in lower productivity growth rates.[2]

The welfare analysis points to the importance of political forces behind low financial development. It identifies a potentially influential group in society that may be, as Rajan and Zingales (2003) put it, "opposed to something as economically beneficial as financial development." If the incumbents do not have to fear competition for credit from not yet established entrepreneurs, they benefit from poor credit contract enforcement; the power to default at low cost provides them with cheap access to credit in equilibrium. Hence, it may be in the interest of the oligarchic elite to hold up an inefficient legal system that gives rise to low credit market development.

As pointed out above, for poor creditor protection to benefit the oligarchs it is crucial that the talented non-members of the elite may not easily open a new business; if there were only little obstacles to entrepreneurship, the non-members could simply employ their savings in an own firm (or become borrowers themselves) rather than lend them at unfavorable terms. Thus, a simple way to assess whether the political economy argument put forth above may be an explanation for low credit market development is to look at the correlation between creditor protection and the extent of entry regulation; the latter variable has recently been shown to be an important obstacle to the creation of new firms (Klapper et al., 2004). A negative

[1] In Aghion and Bolton (1997), the "middle-class" borrowers may benefit from a low interest rate. The reason is that the firm sizes are fixed so that the wealth entrepreneurs are forced to become lenders.

[2] In reality, there are a number of reasons why lower productivity growth rates may come along with such "bad" institutions. For instance, if entry into a specific sector is prohibited, there is little hope the incumbents are the most talented entrepreneurs.

association would indicate that poor creditor protection is more likely to be adopted if the established entrepreneurs benefit, i.e., if the dynamics of the distribution is affected. Using different measures for entry regulation and creditor protection, we find indeed strong evidence in favor of such a correlation in a cross-section of countries - even if one controls for economic development and legal origin.

This paper is most closely related to the literature on the dynamics of the distribution among individuals with ex ante heterogeneous access to *investment opportunities*. Work by Galor and Zeira (1993), Banerjee and Newman (1993), Aghion and Bolton (1997), and Piketty (1997) has contributed to a better understanding under which circumstances initial disparities will be amplified and, to the contrary, when inequality will decrease or even die out over time. This question has also received much attention in recent papers by Matsuyama (2000, 2003).[3] Among all these contributions, the present paper is most closely related to Matsuyama (2000); it is assumed that the established entrepreneurs have access to a CRS technology so that they benefit strongly when poor creditor protection keeps the equilibrium borrowing rate low. However, the model developed here deviates from Matsuyama (2000) by introducing labor as a factor of production and from the whole literature by assuming dynastic preferences; the main point here is to show that there is - beyond different returns to accumulation - an additional channel through which wealth inequality may be amplified over time: poor contract enforcement decreases the worker's propensity to save out of current income. Other closely related work includes Bénabou (1996), the models presented in Aghion and Howitt (1998, Chapter 9), and a recent paper by Castro et al. (2004). This strand of literature is interested in the impact of credit market imperfections on economic growth when individuals are heterogeneous with respect to wealth. As in the present model, credit market imperfections may have a negative influence on the growth rate; however, while the literature emphasizes, for instance, the role of heterogeneous investment returns or lower incentives to supply effort, the argument here is that imperfect creditor protection lowers the (workers') incentives to save.[4] A further important difference to the second strand of literature is that credit market

[3]Matsuyama's work offers also an explanation for endogenous inequality, i.e., for how the distribution among initially identical individuals may become unequal over time if the credit market is imperfect. Similarly, Freeman (1996) and Mookherjee and Ray (2002, 2003) are interested in how the market mechanism can endogenously create inequality.

[4]Castro et al. (2004) show that poor investor protection may actually increase the economy's growth rate in

imperfections - although leading to lower growth rates - are shown to have asymmetric effects on the welfare of different groups in society. This insight offers a political perspective on why some countries have failed to develop a well-functioning credit market. Therefore, the present paper is linked to Rajan and Zingales (2003) who point out that financial development may work against the interest of the established large industrial firms. A similar argument can be found in Beck et al. (2003). Based on the endowment theory put forth by Engerman and Sokoloff (1997) and Acemoglu et al. (2001), they suggest that poor creditor protection - giving rise to low financial development - can be viewed as an "extractive institution" that secures rents for the elite. But while the contributions by Rajan and Zingales and by Beck et al. emphasize the competition-enhancing effects (on the product market) of financial development in general, this paper argues that the lack of a key ingredient to financial development - the enforcement of credit contracts - provides the economic elite with cheap access to credit.

On a broader level, this paper is related to the work by Bertola (1993), Alesina and Rodrik (1994), and Persson and Tabellini (1994) who study policy choices, in particular taxes on capital income, in heterogeneous agent models. These contributions suggest that the workers have an incentive to impose high taxes on capital income - despite the fact that high taxes decrease the growth rate. In this sense, the poorer redistribute from the richer and take into account that the first-best policy is not implemented. In contrast, the present paper suggests that "bad" policies - while decreasing the economy's growth rate - may be chosen not because they benefit the poor but affluent elite.

The remainder of this paper is organized as follows. In Section 2, we show that barriers to entrepreneurship - an important feature in our model - are highly relevant from an empirical point of view. Section 3 sets up the basic model. In Section 4, we do comparative dynamics. Moreover, the welfare implications of imperfect credit are qualitatively discussed and quantitatively illustrated with a numerical example. Finally, Section 5 concludes.

2 Entry Barriers and Financial Development

The distributional consequences of poor creditor protection to be derived below rest upon the assumption of barriers to entrepreneurship. A talented worker may not too easily become an

Diamond's overlapping generations framework: Poor creditor protection shifts income to the young generation (the borrowers) and hence increases, all other things equal, aggregate savings.

entrepreneur and employ his savings in an own - perhaps small - firm. Put differently, the incumbents benefit only if a large part of the population is forced to lend to them because entrepreneurship is a viable choice for the elite only. In reality, there is a large number of potential entry barriers. Limited borrowing itself is an entry barrier if production requires some minimum scale. A further (but complementary) obstacle is costly regulation of entry. The literature suggests that extensive entry regulation is widespread - in particular in poor countries. The purpose of this section is to review some of the evidence and to show that heavy regulation of entry and poor creditor protection go often hand in hand.[5]

In an influential study on business regulation and corruption, De Soto (1989) reports that in Peru in the early eighties a potential entrepreneur had to spend 289 days on 11 bureaucratic procedures to comply with all the regulations. This is equivalent to a loss in net profits of $ 1'231 (in 1983) which corresponds to more than one third of the per capita GDP in 1983. In a systematic survey, Djankov et al. (2002) report similar or even higher barriers to entry (number of bureaucratic procedures, time requirements, cost) in 1999 throughout the developing world. An impressive example is Mozambique. In economic terms, the 19 procedures required there translate into 149 business days and a cost of 111 % of the per capita GDP. This is a more general pattern. The number of procedures is strongly correlated with both the time and the cost requirements to obtain the legal status to operate a firm (Djankov et al., 2002, Table VI). On average, the countries in the lowest quartile of per capita income require 12 procedures and impose a cost (consisting of fees, legal stamps, and so on) amounting to 108 % of the per capita GDP. Yet, the real burden is likely to be much higher than these official costs. Heavy regulation usually goes together with higher perceived corruption indicating that the entrepreneurs are frequently asked for additional, irregular payments to obtain the required permits and licenses (Djankov et al., 2002, Table V). It is obvious that such costly regulation of entry prevents talented individuals from starting a new business. Most of them will not be able to bring up enough capital to finance high administrative expenses and the initial investment at the same time - in particular if borrowing is limited. This reasoning receives support from a recent paper by Klapper et al. (2004) who show that entry regulation hampers the creation of new firms even in Europe.

[5]Note that Rajan and Zingales (2003) have already presented some evidence suggesting that the extent of entry regulation is negatively correlated with stock market development.

It is further interesting to assess whether the countries with particularly high barriers to entrepreneurship are also the countries in which creditor protection is poorest. Such a correlation would be consistent with the view that financial development and entry barriers are jointly determined in the political process to foster the incumbent entrepreneurs' interests. The discussion so far suggests that it is natural to take the (log) number of procedures (LN_#PROC) or, alternatively, the (log) cost as a share of per capita GDP (LN_COST) as crude proxies for entry barriers.[6] To check the robustness of our results we use as a third measure the business regulation index constructed for 1997 by the Heritage Foundation. The rescaled index (BUSINESS_REG) ranges from 1 to 5 with lower scores indicating that the regulation in particular with respect to opening a new business is less burdensome. We also use three alternative measures as proxies for the extent of creditor protection. First, we employ the property rights index for 1999 compiled by the Heritage Foundation (PROPERTY_RIGHTS) that has also been used by Beck et al. (2003). The rescaled index ranges from 1 to 5, with 5 indicating that private contracts - credit contracts, for instance - are very well enforced.[7] Second, we use new data provided by Djankov et al. (2005) on the number of days it takes to enforce a simple debt contract through courts (DAYS).[8] It seems reasonable to assume that a higher number of days lowers the ability of an ordinary creditor to use the legal system in order to resolve a dispute. Finally, a more indirect way to assess creditor protection is to look at how developed the credit market is. It is argued in the literature (e.g., Beck et al., 2003) - and it will be one of the predictions of our model - that poor creditor protection is mirrored in low financial development as measured by the ratio credit to the private sector divided by the GDP (PRIVAT_CREDIT). The data comes from the World Development Indicators and is calculated as an average over the nineties.

As further independent variables we use (log) per capita GDP (LN_pcGDP; Djankov et al., 2002) and dummies for the legal origin (La Porta et al., 1999). These controls are included since they may affect entry regulation and the dependent variable simultaneously. Richer coun-

[6] The cost includes the direct cost associated with meeting the governments requirements plus the monetized value of the entrepreneur's time (calculated as the product of time and the per capita GDP expressed in per business day terms).

[7] More precisely, the index measures the degree to which government protects and enforces laws that protect private property.

[8] The data describe the number of calendar days to enforce a contract of unpaid debt worth 50 % of the country's per capita GDP. For the exact methodology see Djankov et al. (2003).

tries tend to have more complex and specialized economies. In such economies, the optimal amount of resources spent on institutions protecting private property and facilitating economic exchange may ceteris paribus be higher. Similarly, a more specialized economy is ceteris paribus more likely to develop a liquid credit market. At the same time, the optimal extent of regulation may be lower in richer countries because of less severe market failures. Legal origin is included as a control in some regressions since, as argued by La Porta et al. (1999), it is likely to be a important determinant of both the government's willingness to intervene in the economy and its attitude towards the security of property rights.[9] Summary statistics for all variables except legal origin are shown in Table 1.

All in all, we run 18 regressions to assess the relationship between creditor protection and the extent of entry barriers. Each of the alternative dependent variables is regressed on the three proposed proxies for entry barriers. In all the regressions, the (log) per capita GDP is included as a control for economic development. Each regression equation is estimated with and without the controls for legal origin. The results are presented in Table 2. The overall picture supports the view that bad creditor protection goes hand in hand with heavy regulation of entry (see also Figure 1 below). Higher barriers to entry are associated with a lower degree of enforcement of laws protecting private property (regressions 1 - 6). Further, in countries with higher barriers to entry, a creditor has to spend more days to enforce a simple debt contract through courts (regressions 7 and 9 - 12). Finally, at least with LN_COST or BUSINESS_REG as proxies for the entry barriers, heavier regulation of entry is associated with lower financial development as measured by the ratio credit to private sector divided by the GDP (regressions 15 - 18).

Figure 1 here

Quantitatively, the correlation is strongest when creditor protection is measured by the duration of dispute resolution (DAY), perhaps the most appropriate proxy for creditor protection. For instance, a 1-standard-deviation-increase in LN_COST (roughly the difference between the UK and Sweden) is associated with a 100-day-increase - the difference between the UK and Thailand - in the duration of contract enforcement (which corresponds to 47 % of the standard deviation in the dependent variable). Note further that in case of PROPERTY_RIGHTS and

[9] With respect to legal origin, the countries are divided into five categories: English, French, German, Scandinavian, and Socialist.

PRIVATE_CREDIT the (log) per capita GDP enters as expected. Richer countries put - all other things equal - on average more emphasis on the enforcement of the law (protecting private property) and tend to have a more liquid credit market. In contrast, there is no statistically significant association between the duration of enforcement of credit contracts and the level of economic development. Finally, all other things equal, legal origin seems not to play much of a role in predicting creditor protection (results not reported).

The evidence so far suggests the following conclusion. A political process leading to significant barriers to entry is also likely to implement poor creditor protection, or vice versa. The theory developed in the following sections offers a potential explanation for this correlation. It is the *combination* of entry regulation and bad creditor protection that leads to significant redistribution towards the economic elite.

3 The Model

3.1 Technology and Social Structure

Technology. The economy is closed and comprises two sectors. First, there is a capital-intensive sector that produces a (homogeneous) intermediate good. For simplicity, we assume that the intermediate good is produced from capital alone. In particular, all firms operating in this sector have access to a linear technology that allows to produce $A_t^{(1-\alpha)/\alpha}$ units of the intermediate good with one unit of capital. The aggregate production of the intermediate good, denote it by M_t, is therefore given by

$$M_t = A_t^{(1-\alpha)/\alpha} Q_t, \tag{1}$$

where Q_t is aggregate capital invested at date t. For the rest of this section, the productivity parameter A is assumed to grow with the constant rate g. Later on, we will allow g to vary with the industry structure or the level of financial development.

Second, final output is produced with intermediate goods and labor using a CRS production technology that is the same for all firms. Let's further assume that this production technology is is of the Cobb-Douglas type so that the aggregate production of the final good, Y_t, is given by

$$Y_t = L^{1-\alpha} M_t^{\alpha}, \tag{2}$$

where L denotes aggregate labor supply and $0 < \alpha < 1$. The final output can be used for either consumption or investment. The rate of transformation of final output into capital is 1. We take the price of the final good as the numeraire.[10]

Social structure and endowments. The population size is constant over time and normalized to 1. The individuals differ with respect to their endowments and their business opportunities. There are two types of agents. An (exogenous) fraction $\theta \in (0, 1)$ of the population consists of *workers*. Each worker is endowed with $1/\theta$ units of (homogeneous) labor, and the labor endowments are inelastically supplied on a competitive labor market. The workers may also accumulate capital that serves as an input into the intermediate goods sector. However, they may not run an own firm in this sector since entry is de facto prohibited by, for instance, heavy administrative regulation or extensive corruption. As far as workers accumulate capital, they can only act as lenders on a possibly imperfect but competitive credit market (see below). The remaining individuals are called *entrepreneurs*.[11] Each entrepreneur runs an own firm in the capital-intensive intermediate goods sector and does not supply labor but engages in managing the enterprise. We may think of these agents as members of an influential oligarchic elite that has implemented the barriers preventing the non-members from entering the sector. However, since a single capitalist is of measure zero with respect to the whole capitalist class, the market for the intermediate good is competitive. The same applies for the final goods market. Although not crucial to any of our results, it is most coherent to think that the firms in the final goods sector are also owned by the capitalists.

Assume now that the individuals in the range $[0, \theta]$ are workers and those in the range $(\theta, 1]$ are capitalists. Hence, the aggregate labor endowment, the workers' aggregate capital stock, and the entrepreneurs' aggregate capital stock are given by $L \equiv \int_0^\theta (1/\theta) di = 1$, $K_t^L \equiv \int_0^\theta k_{it} di$, $K_t^E \equiv \int_\theta^1 k_{it} di$, respectively, where k_{it} denotes the capital stock owned by individual i at date t. For simplicity, we abstract from heterogeneity within each group with respect to the initial capital endowment. Since the individuals belonging to the same group are perfectly identical in all other respects too, we have $k_{it} = K_t^L/\theta$ if $i \in [0, \theta]$ and $k_{it} = K_t^E/(1-\theta)$ otherwise. Note, finally, that the amount of capital invested by entrepreneur i at date t, q_{it}, not necessarily coincides with the stock of capital owned by capitalist i, k_{it}, due to the possibility of borrowing

[10]The introduction of an intermediate goods sector greatly simplifies the exposition of the optimal firm behavior and the characterization of the equilibrium under imperfect credit (see Subsection 3.2 below).

[11]In what follows, I use the terms "entrepreneur," "oligarch," and "capitalist" interchangeably.

from workers.

Since both the labor market and the market for the intermediate good are competitive, the wage rate, w_t, and the price of the intermediate good, p_t, are given by their respective marginal product. Thus, we have

$$\begin{aligned} w_t &= (1-\alpha)M_t^{\alpha} \text{ and} \\ p_t &= \alpha M_t^{\alpha-1}. \end{aligned} \tag{3}$$

Finally, because each capital unit produces $A_t^{(1-\alpha)/\alpha}$ units of the intermediate good, the marginal product of capital is given by $p_t A_t^{(1-\alpha)/\alpha}$.

3.2 Credit Market

Credit relations and contract enforcement. The credit market is incomplete and imperfect in the following sense. There is only one possible type of credit contract. Capitalists may borrow from workers on a competitive but imperfect credit market. The interest rate in t is called R_t. The credit market is imperfect because a borrower may renege on the credit contract. In particular, he can refuse to pay the interest debt by incurring some cost. Following Matsuyama (2000), we assume that capitalist i loses a fraction $\lambda \in (0, 1]$ of his gross income $p_t A_t^{(1-\alpha)/\alpha} q_{it}$ in case of default on the interest debt which is given by the amount of credit times R_t.[12] Yet, as in Kiyotaki and Moore (1997), he has not to fear other sanctions like, for instance, limited access to the credit market in the following periods. A λ close to 0 stands for a very efficient expropriation technology whereas a value close to 1 indicates strong creditor protection. Henceforth, we refer to λ as the degree of legal protection of creditors. Given these assumptions, a capitalist decides period by period whether to default or not, and he will do so whenever he can improve his period income. We further assume that the lenders take into account these incentives and give only credit up to an amount that makes the borrower indifferent between fulfilling the contract or reneging on the contract. It immediately follows that the maximum amount of credit capitalist i gets is given by $\lambda p_t A_t^{(1-\alpha)/\alpha} q_{it}/R_t$. Thus, capitalist i's maximum firm size (as measured by the capital invested) can be calculated as

[12] A possible interpretation of this cost is that the lender can seize a fraction λ of the capitalist's gross income in the event of repudiation. Hence, $\lambda p_t A_t^{(1-\alpha)/\alpha}$can be seen as the collateral offered to secure the loan.

$\overline{q}_{it} = k_{it} + \lambda p_t A_t^{(1-\alpha)/\alpha} \overline{q}_{it}/R_t$. Solving for $\overline{q}_{it}$ yields

$$\overline{q}_{it} = \frac{1}{1 - \left(\lambda p_t A_t^{(1-\alpha)/\alpha}/R_t\right)} k_{it}, \quad i \in (\theta, 1], \tag{4}$$

where k_{it} denotes the stock of capital owned by capitalist i. Equation (4) tells us that richer entrepreneurs can borrow more. If R_t is larger than λ times the marginal product of capital, as it will be the case in equilibrium, the maximum firm size is an affine-linear function of the entrepreneur's wealth, k_{it}. The reason is that, due to imperfect contract enforcement, the entrepreneurs have to contribute $1 - \lambda p_t A_t^{(1-\alpha)/\alpha}/R_t$ capital units per unit invested as a down-payment.

What will be entrepreneur i's *optimal* firm size (i.e., his optimal gross capital demand), given restriction (4) and the price of the intermediate good? If the borrowing rate exceeds the marginal product of capital, he will simply run a firm of size k_{it}. Obviously, he will not go into debt. On the other hand, he will not become a lender either since we have ruled out credit contracts between entrepreneurs. If the borrowing rate is exactly equal to the marginal product of capital, he will be prepared to employ any amount of capital in his firm while restriction (4) limits the maximum firm size to $(1-\lambda)^{-1} k_{it}$. Thus, the entrepreneur's gross capital demand may take any value on the interval $[k_{it}, (1-\lambda)^{-1} k_{it}]$. Finally, in case of $R_t < p_t A_t^{(1-\alpha)/\alpha}$, he would like to get an infinite amount of credit since he may appropriate a rent on each unit borrowed. However, the incentive constraint (4) limits the maximum firm size to $\overline{q}_{it}$. This upper bound increases as the borrowing rate goes down and approaches infinity as R_t goes to λ times the marginal product of capital (see Figure 2 below).

Figure 2 here

Lowering the borrowing rate reduces, all other things equal, the benefits from breaking the credit contract while the cost of doing so remains unchanged. This allows the entrepreneur to seek additional credit without inducing him to renege on the interest debt.

Equilibrium borrowing rate. Let's turn to the aggregate level. Aggregate gross capital supply in this economy is the sum of the workers' aggregate capital stock, K_t^L, and the entrepreneurs' aggregate capital stock, K_t^E. Hence, aggregate gross capital supply at date t is equal to $K_t \equiv K_t^L + K_t^E$. Aggregate gross capital demand is the sum over the optimal firm sizes characterized above. For a given price of the intermediate good, it equals K_t^E if the borrowing rate exceeds the marginal product of capital; it lies on the interval $[K_t^E, (1-\lambda)^{-1} K_t^E]$ if R_t is equal to the the marginal product of capital; finally, it is given by the aggregate borrowing constraint $\left\{1 - \left(\lambda p_t A_t^{(1-\alpha)/\alpha} / R_t\right)\right\}^{-1} K_t^E$ if the borrowing rate lies below the marginal product of capital (see Figure 3 below for a graphical representation of the demand schedule).

The equilibrium borrowing rate has to equate gross capital demand and gross capital supply. Thus, we have we have $R_t = p_t A_t^{(1-\alpha)/\alpha}$ if $K_t^E \leq K_t \leq (1-\lambda)^{-1} K_t^E$ (see Figure 3a). Otherwise, if the inequality

$$\lambda < \frac{K_t^L}{K_t} \equiv \kappa_t \tag{5}$$

holds, aggregate gross capital demand would fall short of aggregate gross capital supply, K_t, if the borrowing rate were equal to the marginal product of capital. Hence, the borrowing rate has to be lower than the marginal product of capital in order to give the borrowers weaker incentives to default. More precisely, we must have $R_t = \lambda p_t A_t^{(1-\alpha)/\alpha} / \kappa_t$ so that K_t^L can *exactly* be absorbed by the entrepreneurs (see Figure 3b). To summarize, we have

$$r^L (K_t/A_t, \kappa_t) = R_t = \begin{cases} \frac{\lambda}{\kappa_t} p_t A_t^{(1-\alpha)/\alpha} = \frac{\lambda}{\kappa_t} \alpha (K_t/A_t)^{\alpha-1} & : \kappa_t > \lambda \\ p_t A_t^{(1-\alpha)/\alpha} = \alpha (K_t/A_t)^{\alpha-1} & : \kappa_t \leq \lambda \end{cases}, \tag{6}$$

where r^L denotes the workers' return to capital. To derive the last two equalities in the above equation we substitute for p_t and account for the fact that the full aggregate capital stock in t will be employed and hence $Q_t = K_t$. Note, finally, that default will not occur in equilibrium. The credit market is imperfect because it is possible to default.[13]

Figure 3 here

The fact that the workers face a return below the marginal product of capital if condition (5) holds is due to the combination of two key elements of the economy. First, only entrepreneurs can productively employ capital, workers are excluded from entrepreneurial activities by assumption. Put differently, the workers have to become lenders in order to earn a positive return since they do not have an alternative use for their accumulated savings. Second, the entrepreneurs have the power to default at relatively low cost if creditor protection is poor.

[13]The static equilibrium without an intermediate goods sector, i.e., if the final good were *directly* produced with capital and labor, would be equivalent to the present equilibrium if punishment in case of default were a fraction λ of the firm revenue minus wages.

In equilibrium, this may force the lenders to charge low interest rates in order to allocate their capital holdings productively. All other things equal, this is the more likely the higher the workers' share in aggregate capital is. Note, however, that the workers need not to own much capital (in a relative sense) in order to face a return below the marginal product. If contract enforcement is very bad, a tiny fraction suffices to have the borrowing rate below $p_t A_t^{(1-\alpha)/\alpha}$.

Entrepreneurs' rate of return. The entrepreneurs' rate of return, denote it by r_t^E, can now be calculated as follows. Suppose first that $\kappa_t > \lambda$ so that the interest rate lies below the marginal product of capital. Under these circumstances, the entrepreneurs seek the maximum amount of credit and, consequently, run a firms of size $\overline{q}_{it}$. Entrepreneur i's income is given by his revenue minus the interest debt. Formally, entrepreneur i earns $p_t A_t^{(1-\alpha)/\alpha} \overline{q}_{it} - (\overline{q}_{it} - k_{it}) R_t$. Substituting for $\overline{q}_{it}$ (equation 4) and R_t (equation 6) greatly simplifies this expression:

$$\text{Entrepreneur } i\text{'s income } = \frac{(1-\lambda)}{(1-\kappa_t)} p_t A_t^{(1-\alpha)/\alpha} k_{it}, \quad \kappa_t > \lambda.$$

Finally, to calculate the rate of return, we divide the entrepreneur's period income by his capital stock, k_{it}. Thus, we have $r_t^E = (1-\lambda) p_t A_t^{(1-\alpha)/\alpha} / (1-\kappa_t)$. Suppose now that $\kappa_t \leq \lambda$. In this case, of course, r_t^E equals the marginal product of capital. To summarize,

$$r^E\left(K_t/A_t, \kappa_t\right) = \begin{cases} \frac{1-\lambda}{1-\kappa_t} p_t A_t^{(1-\alpha)/\alpha} = \frac{1-\lambda}{1-\kappa_t} \alpha \left(K_t/A_t\right)^{\alpha-1} & : \quad \kappa_t > \lambda \\ p_t A_t^{(1-\alpha)/\alpha} = \alpha \left(K_t/A_t\right)^{\alpha-1} & : \quad \kappa_t \leq \lambda \end{cases}. \tag{7}$$

Equations (6) and (7) show that only in case of $\kappa_t \leq \lambda$ the returns to capital are equalized between workers and entrepreneurs. Otherwise, if the borrowing rate lies below the marginal product of capital, the entrepreneurs' return exceeds the workers' one. Put differently, if $\kappa_t > \lambda$, there is a *spread* in the rate of return because an entrepreneur's additional income from a borrowed capital unit exceeds what he has to pay for this unit. In contrast to the standard Ramsey-Cass-Koopmans model, the individual returns here depend not only on the level of the capital stock but also on its distribution.

3.3 Optimal Consumption and Aggregate Dynamics

This subsection solves the individuals' consumption-savings decision and derives the equations governing aggregate dynamics. To this end, we introduce the following definitions. We write $r_t^L \equiv r^L\left(K_t/A_t, \kappa_t\right)$ and $r_t^E \equiv r^E\left(K_t/A_t, \kappa_t\right)$ if convenient. Moreover, a $(\widehat{\ })$ over a variable denotes the variable divided by A, the index of the state of technology. For example, we employ the definition $\widehat{K}_t \equiv K_t/A_t$ and call $\widehat{K}$ the aggregate capital stock in efficiency units. Finally, we substitute in equation (3) for M_t and write

$$w_t \equiv w(A_t, K_t/A_t) = (1-\alpha)A_t\left(K_t/A_t\right)^{\alpha}. \tag{8}$$

Optimal individual consumption. All individuals derive utility from consumption of the final good. They are assumed to divide the income in each period (as measured in units of the final good) into consumption and savings in a way that maximizes the intertemporal utility function

$$U_i = \sum_{t=0}^{\infty}\left(\frac{1}{1+\rho}\right)^t \ln c_{it}, \tag{9}$$

where ρ and c_{it} denote, respectively, the rate of time preference and individual i's consumption at date t. Today's savings contribute one-to-one to the capital stock of tomorrow such that the individual stocks evolve according to

$$k_{it+1} = (1+r_{it})k_{it} + l_i w_t - c_{it}, \tag{10}$$

where $r_{it} = r_t^L$, $l_i = \frac{1}{\theta}$ if $i \in [0,\theta]$ and $r_{it} = r_t^E$, $l_i = 0$ otherwise. Since there is no uncertainty, the individuals can perfectly forecast the future values of $\widehat{K}_t$ and κ_t and, consequently, those of r_t^L, r_t^E and w_t. Then, optimal behavior implies that the law of motion for individual consumption is given by the Euler equation

$$c_{it+1} = \frac{1+r_{it+1}}{1+\rho}c_{it} \tag{11}$$

and that initial consumption, c_{i0}, is chosen in a way satisfying the transversality condition

$$\lim_{T\to\infty}\frac{k_{iT+1}}{\prod_{m=1}^{T}\left(1+r_{it+m}\right)} = 0.$$

Using the intertemporal budget constraint, it can be shown that consumption of worker $i \in [0,\theta]$ is given by

$$c_{it} = \frac{\rho}{1+\rho}\left((1+r_t^L)k_{it} + h_t\right), \tag{12}$$

where $h_t = \sum_{j=0}^{\infty}\left((1+r_t^L)w_{t+j}\frac{1}{\theta}/\prod_{m=0}^{j}\left(1+r_{t+m}^L\right)\right)$ denotes the present value of the worker's labor endowment.[14] Substituting for c_{it} in equation (10) results in

$$k_{it+1} = \frac{1+r_t^L}{1+\rho}k_{it} + \left(\frac{1}{\theta}w_t - \frac{\rho}{1+\rho}h_t\right). \tag{13}$$

[14] Since the workers may not borrow it is implicitly assumed that a representative worker may follow this optimal consumption rule without violating the $(k_{it} \geq 0)$-constraint. This is indeed the outcome of all the simulations we have performed.

The corresponding equations for an entrepreneurs $i \in (\theta, 1]$ are given by the particularly simple policy functions

$$c_{it} = \frac{\rho}{1+\rho}(1+r_t^E)k_{it} \text{ and } k_{it+1} = \frac{1+r_t^E}{1+\rho}k_{it}. \tag{14}$$

Note that, due to the log-preferences, the consumption behavior of the capitalists depends only on the current state of the economy and is independent of the future evolution of K_t and κ_t.

Aggregate Dynamics. The specific micro-foundation of imperfect credit chosen in the present paper makes the aggregation of individual variables highly tractable. Summing up individual consumption levels (equations 12 and 14) and standardizing yields

$$\widehat{C}_t = \frac{\rho}{1+\rho}\left(\left(1+\alpha\widehat{K}_t^{\alpha-1}\right)\widehat{K}_t + \widehat{H}_t\right), \tag{15}$$

where $\widehat{C}_t$ is aggregate consumption and

$$\widehat{H}_t = \widehat{w}_t + \frac{(1+g)\widehat{w}_{t+1}}{\left(1+r_{t+1}^L\right)} + \frac{(1+g)^2\widehat{w}_{t+2}}{\left(1+r_{t+1}^L\right)\left(1+r_{t+2}^L\right)} + \cdots \tag{16}$$

denotes the present value of the aggregate labor endowment (both in efficiency units). Later on, it will be helpful to know the law of motion of the latter variable. By manipulating equation (16) we get

$$\widehat{H}_{t+1}(1+g) = \left(\widehat{H}_t - \widehat{w}_t\right)(1+r_{t+1}^L). \tag{17}$$

Note that the credit market imperfection may affect aggregate consumption only through future rates of return, $r_{t+1}^L, r_{t+2}^L, r_{t+3}^L, \cdots$, that influence the present value of labor income. In particular, whenever κ exceeds λ in future periods, the workers' rate of return lies below the marginal product of capital while these values always coincide in case of a perfect credit market. In contrast, the credit market imperfection has no influence on aggregate consumption via redistributing current capital income. The reason is that the two groups adjust consumption in response to such redistribution in an exactly offsetting way.

Further, aggregating equation (10) across individuals and using the expression for aggregate consumption (equation 15) allows us to derive the law of motion of $\widehat{K}$ as

$$\widehat{K}_{t+1}(1+g) = \frac{1}{1+\rho}\widehat{K}_t + \frac{1+\rho(1-\alpha)}{1+\rho}\widehat{K}_t^{\alpha} - \frac{\rho}{1+\rho}\widehat{H}_t. \tag{18}$$

Again, the credit market imperfection enters only through its impact on the present value of labor income. For further use below, we rewrite this equation slightly. Solving equation (17) for $\widehat{H}_t$ and using the resulting expression in equation (18) yields

$$\widehat{K}_{t+1}(1+g) = \frac{1}{1+\rho}\widehat{K}_t + \frac{1}{1+\rho}\widehat{K}_t^{\alpha} - \frac{\rho}{1+\rho}\frac{\widehat{H}_{t+1}(1+g)}{1+r_{t+1}^L}. \tag{18'}$$

The discussion so far suggests that, in case of a perfect credit market, the economy considered here is formally equivalent to the (representative agent) textbook Ramsey-Cass-Koopmans model. The introduction of both a protected intermediate goods sector and heterogeneity, if not accompanied by poor contract enforcement, has no influence on the aggregate behavior of the economy. Consequently, an economy with $\lambda = 1$ is called a *first-best* economy or, equivalently, a *benchmark* economy.

4 Comparative Dynamics and the Steady State

This section compares the dynamics of aggregate capital and capital ownership under perfect ($\lambda = 1$) and imperfect ($\lambda < 1$) credit, respectively, and explores the welfare implications of poor creditor protection. To this end, we focus on two economies that differ at date 0 only in λ but are otherwise completely identical. In particular, the values of $\widehat{K}_0$ and κ_0 are the same. In addition, it is assumed that the first-best economy ($\lambda = 1$) grows *from below* towards the steady state. Thus, for given initial conditions $\widehat{K}_0$ and κ_0, we know that the first-best economy converges to the corresponding (constant) steady state values $\widehat{K}^*$ and $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$, respectively. The notation makes transparent that, with $\lambda = 1$, the steady state distribution of capital (but not the level) depends on the initial conditions.[15]

The first step in doing comparative dynamics is to keep track of κ, the workers' share in aggregate capital, in case of a perfect credit market (Subsection 4.1). Subsection 4.2 derives the comparative-dynamic results and the welfare implications of poor creditor protection. Subsection 4.3 proves convergence to a steady-state also in case of $\lambda < 1$. Finally, in Subsection 4.4, the model is calibrated to quantify the impact of poor creditor protection.

[15] See Bertola, Foellmi, and Zweimueller (2005), Chapter 3.

4.1 Behavior of the Benchmark Economy

To derive the behavior of κ in case of the benchmark economy ($\lambda = 1$), it is convenient to calculate the steady state values of $\widehat{K}$ and r first. These values are given by

$$\widehat{K}^* = \left(\frac{\alpha}{\rho + g + \rho g}\right)^{\frac{1}{1-\alpha}} \text{ and } 1 + r^* = (1+\rho)(1+g),$$

respectively. Moreover, the present value of labor income (in efficiency units) equals $(1 + \rho)\rho^{-1}\widehat{w}^*$ so that H_t and $(1+r^*)K_t$ (as well as the aggregate output and aggregate consumption) grow at the same rate, g, in steady state. Of course, this is consistent with the fact that κ is a constant on the balanced growth path. The lemma below relates this constant to the initial value, κ_0. Note, however, that - although the economy *converges* to a particular value of κ - any level of κ can be supported in a steady state.

Lemma 1 *Let $\lambda = 1$. Then, we have $\kappa_t < \kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$ for all $t \geq 0$.*

Proof. *Suppose first that κ never falls and never stays unchanged during the transition towards the steady state. Then, the claim immediately follows.*

Suppose now that κ decreases or remains constant at least once. By aggregating equation (14) across entrepreneurs and remembering equation (15) we can calculate the capitalists' share in aggregate consumption, C_t^E/C_t, as $(1-\kappa_t)(1+r_t)\widehat{K}_t\left((1+r_t)\widehat{K}_t + \widehat{H}_t\right)^{-1}$. From the Euler equation, this ratio does not change over time since - in the first-best economy - the rate of return is the same for workers and entrepreneurs. In particular, C_t^E/C_t takes the same value in the transition towards the steady state as in the steady state. Hence, using $1+r^* = (1+\rho)(1+g)$ and $\widehat{H}^* = (1+\rho)\rho^{-1}\widehat{w}^*$, we get

$$\frac{C_t^E}{C_t} = (1-\kappa_t)\frac{(1+r_t)\widehat{K}_t}{(1+r_t)\widehat{K}_t + \widehat{H}_t} = (1-\kappa^{*1})\gamma, \tag{L1-1}$$

where

$$\gamma \equiv \frac{\alpha\rho(1+g_B)}{\rho + g(1+\rho-\alpha)}.$$

Suppose now that $\kappa_{t+1} \leq \kappa_t$ or, equivalently, that $1-\kappa_{t+1} \geq 1-\kappa_t$. Then, since

$$(1-\kappa_{t+1}) = (1-\kappa_t)\frac{(1+r_t)\widehat{K}_t}{(1+r_t)\widehat{K}_t + (1+\rho)\widehat{w}_t - \rho\widehat{H}_t},$$

we have $(1+\rho)\widehat{w}_t - \rho\widehat{H}_t \leq 0$ *or, equivalently,* $\widehat{H}_t \geq \frac{(1+\rho)}{\rho}\widehat{w}_t$*. Using this inequality in equation (L1-1) leaves us with*

$$(1-\kappa_t)\delta(\widehat{K}_t) \geq (1-\kappa^{*1})\gamma,$$

where

$$\delta(\widehat{K}_t) = \frac{1+\alpha\widehat{K}_t^{\alpha-1}}{1+\alpha\widehat{K}_t^{\alpha-1}+(1+\rho)\rho^{-1}(1-\alpha)\widehat{K}_t^{\alpha-1}}.$$

Further, since $\widehat{H}^* = (1+\rho)\rho^{-1}\widehat{w}^*$, $\delta(\widehat{K}^*)$ *equals* γ*. Then, because* $\delta'(\widehat{K}_t) > 0$ *for* $\widehat{K}_t < \widehat{K}^*$*, we have* $\delta(\widehat{K}_t) < \gamma$ *if* $\widehat{K}_t < \widehat{K}^*$*. Hence,*

$$(1-\kappa_t) > (1-\kappa^{*1}) \text{ or } \kappa^{*1} > \kappa_t.$$

Finally, assume that κ *decreases (or remains constant) for the first time between* $\tau \geq 0$ *and* $\tau+1$*. Then,* $\kappa^{*1} > \kappa_\tau \geq \kappa_0$*.* ■

Lemma (1) is interesting beyond the subject of this paper because it allows to infer the dynamics of capital ownership and current income in class societies. When (initially) a large part of the capital stock is owned by a small elite and most individuals derive their income almost exclusively from labor, the distribution of capital becomes more equal over time (see Figure 4 below).[16] The same applies for the distribution of current incomes.

Figure 4 here

The intuition is as follows. During the transition towards the steady state, the accumulated wealth, $(1+r_t)K_t$, grows on average faster than the non-accumulated wealth, H_t. At the same time, aggregate consumption of workers and capitalist grow pari passu (see Euler equation). Given the workers' and the entrepreneurs' optimal consumption rules (12) and (14), respectively, this is only possible if the workers' share in aggregate capital increases over time.

[16] A similar result in a neoclassical setting has already been obtained by Stiglitz (1969) using an ad hoc consumption function. The equalizing force in the Solow-type model, though, is a different one. Convergence is due to a rising wage rate during the transition to the steady state and a due to a negative propensity to consume out of accumulated wealth in the steady state.

4.2 Comparative Dynamics and Welfare

We first derive the comparative-dynamic results. In a second step, these results are used to asses the welfare implications of poor creditor protection.

Comparative dynamics. An immediate implication of Lemma (1) is that imperfect creditor protection has no impact whatsoever if λ is relatively high. More precisely, if λ exceeds $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$ and the workers stick to their first-best consumption level at date 0, κ can grow towards κ^{*1} without inducing a spread in the rate of return at future dates (see Figure 5, "high" λ). Consequently, the workers do not deviate from their first-best behavior at any point in time (and the capitalists do not deviate either). But this means that the dynamics towards the steady state does not differ from the dynamics that would prevail in the first-best economy.

Figure 5 here

In what follows we concentrate on an economy with relatively low creditor protection so that $\kappa^{*1} > \lambda$ (see Figure 5, "low" λ). In this situation, poor creditor protection is shown to have a (large) impact on how the economy evolves over time. The starting point of the analysis is to show that aggregate consumption will be higher (as compared to the benchmark economy) at early stages of development.

Lemma 2 *Let $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right) > \lambda$. Then, $\widehat{C}_0$ is strictly higher under imperfect credit. Hence, $\widehat{K}_1$ must be smaller in the imperfect economy.*

Proof. *Suppose first that $\widehat{C}_0$ is strictly lower under imperfect credit. According to equation (15), this can only be true if $\widehat{H}_0$ is strictly lower than in the first-best economy case. Then, since $\widehat{K}_0$ is exogenous, $\widehat{K}_1$ must be higher under imperfect credit (equation 18). Accordingly, r_1^L will be lower and $\widehat{w}_1$ will be higher (both in a strict sense) than in the first-best economy case (equations 6 and 8). Since $\widehat{w}_0$ is the same in both situations and r_1^L is strictly lower under imperfect credit it follows from equation (17) that $\widehat{H}_1$ must be strictly lower (as compared to the first-best economy case). Therefore, we may infer that $\widehat{K}_2$ is higher and, consequently, that r_2^L ($\widehat{w}_2$) is lower (higher) than in the benchmark economy. Very similar to the step before, it must then be that $\widehat{H}_2$ is strictly lower under imperfect credit. We may now repeat these arguments ad infinitum and conclude that, under the premise made above, the capital stock under imperfect credit must be strictly higher at all future dates $t > 0$. Since a higher stock of* *capital is associated with a lower worker's rate of return and a higher wage rate, $\widehat{H}_0$ must be strictly higher as well (equation 16). But this contradicts our initial assumption.*

Suppose now that $\widehat{C}_0$ is the same under perfect and imperfect credit implying that also $\widehat{H}_0$ is the same in both situations. Suppose further that $\kappa_0 < \lambda$. Then, the two economies must evolve completely parallel until κ reaches λ. From Lemma (1) and the assumption $\kappa^{*1} > \lambda$ we know that κ must cross the λ-threshold at some point in time. Suppose that this happens for the first time in $t = \tau$, i.e., $\kappa_\tau > \lambda$ and $\kappa_t \leq \lambda$ $\forall t < \tau$. Again, it is important to note that before τ both $\widehat{H}$ and $\widehat{K}$ (as well as the worker's rate of return and the wage rate) do not differ from their first-best economy counterparts and this is even true for $\widehat{K}_\tau$. But since r^L_τ is strictly lower under imperfect credit than under perfect credit, $\widehat{H}$ is (for the first time) strictly lower under imperfect credit in τ. We can now use the same arguments as in the first part of the proof in order to end with the contradiction that $\widehat{H}_0$ must be strictly higher under imperfect credit. In case of $\kappa_0 \geq \lambda$ this second part of the proof can be carried out in a similar way.

Having led the assumption that $\widehat{C}_0$ is smaller (or the same) under imperfect credit to a contradiction, we conclude that $\widehat{C}_0$ must be strictly higher in the imperfect economy. This, in turn, implies that $\widehat{K}_1$ is smaller. ■

Lemma (2) shows that poor creditor protection is reflected in a low savings rate out of aggregate income at date 0. The reason is that low returns to accumulated wealth, either right from the beginning if $\kappa_0 > \lambda$ or somewhere in the future if $\kappa_0 \leq \lambda$, deteriorate the workers' incentives to save. More precisely, the credit market imperfection alters, all other things equal, the sequence of interest rates $r^L_1, r^L_2, r^L_3, \cdots$, in a way that must increase the present value of labor income at date 0. The latter, in turn, determines (together with the accumulated wealth) current consumption. Hence, in case of $\kappa_0 \leq \lambda$, workers' initial consumption is increased (as compared to the benchmark economy) while the entrepreneurs do not deviate from their benchmark level. Obviously then, $\widehat{C}_0$ is higher under imperfect credit. In this context it is worth pointing out that imperfect enforcement of credit contracts may alter individual behavior long before the symptom of the imperfection, i.e., the spread in the return to capital, appears for the first time. Otherwise, if $\kappa_0 > \lambda$ and therefore $r^L_0 < r^E_0$, workers' consumption may be higher or lower than in the benchmark economy (because of their lower current capital income) while entrepreneurs' initial consumption is higher for sure. The net effect on aggregate consumption, however, has to be positive.

We are now ready to compare the speed of accumulation under perfect and imperfect credit, respectively, and to discuss the welfare implications of poor creditor protection. We already know from Lemma (2) that, under imperfect credit, the aggregate stock of capital is strictly lower at date 1 due to the higher present value of labor income at date 0. Moreover, it can now be shown that $\widehat{K}$ is always lower under imperfect credit. To see this, suppose, to the contrary, that at some date, say $\tau + 1$, $\widehat{K}$ is for the *first time* strictly higher in the imperfect economy than in the benchmark economy, i.e., suppose that $\widehat{K}_{\tau+1}$ is strictly higher and that $\widehat{K}_t$ is lower or equal for all $t \leq \tau$. Then, $r^L_{\tau+1}$ must be strictly smaller in the former case (equation 6). So, for $\widehat{K}_{\tau+1}$ to be strictly higher under imperfect credit, $\widehat{H}_{\tau+1}$ must be strictly lower (equation 18') such that, again, $\widehat{K}_{\tau+2}$ is strictly higher with imperfect credit markets (equation 18). This, in turn, implies that $\widehat{H}_{\tau+2}$ is smaller under imperfect credit which leads to a higher $\widehat{K}_{\tau+3}$, and so on. Hence, from $\tau + 1$ onwards, the interest rate relevant for workers will be strictly lower (as compared to the first-best world) and the wage rate will be strictly higher. But this means that $\widehat{H}_{\tau+1}$ must be strictly higher under imperfect credit (equation 16) which is a contradiction. The assumption that the capital stocks are equal under perfect and imperfect credit at some points in time can be led to a contradiction in a similar way. Further, since the benchmark economy monotonically converges to $\widehat{K}^*$, we also have $\widehat{K}_t < \widehat{K}^*$, $t \geq 0$, in an economy with an imperfect credit market. These results are stated in the following proposition (proof in the text).

Proposition 1 *Let* $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right) > \lambda$. *Then,* $\widehat{K}_t$ *is strictly lower under imperfect credit for all* $t > 0$. *Hence,* $\widehat{K}_t < \widehat{K}^*$ *for all* $t \geq 0$.

An immediate implication is that the workers' share in aggregate capital, κ_t, is strictly lower under imperfect credit for all $t > 0$. From Proposition (1) and equation (7), it follows directly that, under imperfect credit, r^E_t is strictly higher at all future dates $t > 0$ no matter whether there is a spread in the rate of return ($\kappa_t > \lambda$) or not ($\kappa_t \leq \lambda$). Moreover, r^E_0 is equal or higher under imperfect credit. Consequently, the entrepreneurs' aggregate capital stock, K^E, is equal or higher at date 1 and strictly higher (as compared to the perfect economy benchmark) at any date $t > 1$ (equation 14). Since $K^E_t/K_t = (1 - \kappa_t)$ and by Proposition (1), our claim follows. The fact that the workers accumulate less has also implications for the ratio aggregate amount of credit divided by aggregate output (K^L_t/Y_t), an in the empirical literature widely used measure for "financial development." According to this measure, the model predicts that "financial development" is lower with imperfect creditor protection since the workers, excluded from entrepreneurial activities by assumption, are the creditors in this economy. To summarize (proof in the text),

Proposition 2 *Let* $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right) > \lambda$*. Then, both* κ_t *and the ratio* K_t^L/Y_t *are strictly smaller for all* $t > 0$ *under imperfect credit.*

So, given that the initial distribution of capital is sufficiently uneven in the sense that the economic elite possesses a disproportionate part of the aggregate capital stock, the distribution of accumulated wealth between workers and entrepreneurs (and also the distribution of current income) is always more unequal under imperfect credit (as compared to the first-best economy). According to the present model, poor creditor protection in an oligarchic society ensures that capital remains concentrated (or becomes even stronger concentrated) in the hands of those who may invest. Knowing this, it is interesting to ask whether the workers' incentives to save are still strong enough to push κ beyond λ in case of $\kappa_0 < \lambda$.

Proposition 3 *Let* $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right) > \lambda$*. Then, whenever* κ *is below* λ*, it must be strictly higher at least at one date in the future.*

Proof. *Suppose first that* $\kappa_0 < \lambda$*. By Lemma (2) and equation (15), both* $\widehat{C}_0$ *and* $\widehat{H}_0$ *must be strictly higher under imperfect credit. Suppose now that* $\kappa_t \leq \lambda$ *for all* $t \geq 0$*. Then, along the lines of the proof of Lemma (2), it can be shown that* $\widehat{K}_t$ *will be smaller than in the perfect economy at all dates* $t > 0$*. Consequently, for all* $t > 0$*,* r_t^L (w_t) *must be strictly higher (strictly lower) under imperfect credit (equations 6 and 8). But this translates into a smaller* $\widehat{H}_0$ *(equation 16) which contradicts Lemma (2). Hence,* κ *must pass* λ *from below at some future date. Suppose now that* κ *reaches (or falls below)* λ *from above at some date* $\tau + 1$*. From Lemma (1) we know that* $\kappa^{*1}\left(\widehat{K}_\tau, \kappa_\tau\right) > \lambda$*. Hence, by Lemma (2) and equation (15), both* $\widehat{C}_\tau$ *and* $\widehat{H}_\tau$ *must be strictly higher than in a perfect economy that starts with* $\widehat{K}_\tau$ *and* κ_τ*. Then, using the same arguments as above,* κ *must pass* λ *from below at some later date again.* ■

Proposition (3) can be understood as follows. According to Lemma (2), the present value of aggregate labor income, $\widehat{H}_0$, must be higher under imperfect credit while Proposition (1) implies that, at any point in time, the wages (the marginal product of capital) are comparatively low (high) so that $\widehat{H}_0$ tends to be low. Proposition (3) states now that a slower accumulation and a higher present value of labor income can only go together when, some time, the workers discount future labor income with less than the marginal product of capital. Hence, there must be at least one period in which the workers' share in aggregate capital exceeds λ. But not only that. Every time when κ falls below λ later on, it has to exceed this threshold again in the future. Note that this latter observation allows us to compare the growth rate of the imperfect economy in each period t with the growth rate that would prevail in a hypothetical first-best economy with κ_t and $\widehat{K}_t$. It implies that, whatever values the state variables κ_t and $\widehat{K}_t$ will take in the imperfect economy, such a first-best economy would converge to a steady state level of κ lying above λ. Formally, we have $\kappa^{*1}\left(\widehat{K}_t, \kappa_t\right) > \lambda$, $t > 0$. But then, by Lemma (2), the growth rate of imperfect economy is lower in any period t than the growth rate of the hypothetical first-best economy.

Welfare implications. The comparative-dynamic results allow us to make clear-cut welfare predictions. In particular, we can use them to prove another important result of the present paper, namely that the entrepreneurs are better off with imperfect contract enforcement. We already know that the entrepreneurial rate of return, r_t^E, $t > 0$, is strictly higher under imperfect credit. Hence, according to the Euler equation, the capitalists must be on a steeper consumption path as compared to the benchmark economy. Finally, since the capitalists' initial consumption level is equal to (in case of $\kappa_0 \leq \lambda$) or higher than (in case of $\kappa_0 > \lambda$) the benchmark level, they consume strictly more in each period $t > 0$ so that their lifetime utility (9) rises. Conversely, since the outcome in the first-best economy is on the utility possibility frontier, the workers must be worse off. To summarize (proof in the text),

Proposition 4 *Let $\kappa^{*1}\left(\widehat{K}_0, \kappa_0\right) > \lambda$. Then, the entrepreneurs are strictly better off under imperfect credit. In contrast, the workers lose.*

The intuition behind the above proposition involves two key elements. First, poor creditor protection reduces the workers' incentives to save - resulting in a slower pace of capital accumulation. A lower aggregate capital stock at all future dates, in turn, means that the marginal product of capital is higher at any point in time. Since the entrepreneurs derive income solely from employing capital, they experience (as compared to the benchmark economy) a higher income in each period. Put differently, the entrepreneurs benefit because the factor from which they derive their income is relatively scarce at each point in time. Second, even though the workers accumulate less, κ has to exceed λ at some points in time if it is below this threshold when the economy starts. Hence, at least at some dates, the borrowing rate lies below the marginal product of capital. Low borrowing rates, in turn, are associated with an entrepreneurial rate of return the above marginal product of capital. Again, the entrepreneurs must benefit. The workers are worse off for the same two reasons. First, a slower pace of capital accumulation means that the marginal product of labor and hence the wages are lower at all future dates $t > 0$. Second, at least at some dates, the workers' return to capital is lower than the marginal product of capital.

In Subsection 4.4, the model is calibrated to get an intuition to what an extent the entrepreneurs win. In addition, the calibration exercise provides evidence that the gains monotonically decrease in λ.

4.3 Convergence and the Steady State

We now consider whether there is a steady state in an economy with imperfect contract enforcement and, if so, whether such an economy converges to its balanced growth path.

Let's turn to the existence of a steady state first. From above, we know that the first-best economy is on the balanced growth path if the aggregate capital stock (in efficiency units) equals $\widehat{K}^*$. In addition, it has been mentioned that the distribution of aggregate capital is constant under balanced growth. From this, it follows directly that in case of $\lambda < 1$ any combination of state variables $\left(\widehat{K}^*, \kappa\right)$, $\kappa \in [0, \lambda]$, is consistent with steady state growth since, for these values, we have $r^L = r^E = r^*$. Therefore, the dynamics of the imperfect economy does not differ from that in the first-best economy. In particular, κ is a constant so that poor creditor protection may never play a role.

It remains to prove convergence. As in the previous subsection, we concentrate on the interesting case where $\lambda < \kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$. The first step is to show that, also in this case, the aggregate capital stock monotonically increases over time.

Lemma 3 *Let $1 + r_0^L \geq (1+\rho)(1+g)$. Then, $\widehat{K}_{t+1} > \widehat{K}_t$ for all $t \geq 0$.*

Proof. *To see that aggregate savings are strictly positive in $t = 0$, assume, to the contrary, that $\widehat{K}_1 \leq \widehat{K}_0$. Since $\widehat{K}_1^E > \widehat{K}_0^E$, we have $\widehat{K}_1^L < \widehat{K}_0^L$ and therefore $\kappa_1 < \kappa_0$, implying that $1+r_1^L > 1+r_0^L \geq (1+\rho)(1+g_B)$. Hence, according to the Euler equation, $\widehat{C}^L$ must rise between* *the dates 0 and 1. Likewise, we have $\widehat{C}_1^E > \widehat{C}_0^E$ and therefore $\widehat{C}_1 > \widehat{C}_0$. Then, by equation (15), $\widehat{H}_1 > \widehat{H}_0$. Finally, it fallows from equation (18) that $\widehat{K}_2 < \widehat{K}_1 \leq \widehat{K}_0$. This sequence of steps can be repeated to see that $\widehat{K}^L$ will eventually reach zero. At that point, however, the workers can no longer follow the Euler equation since they may not borrow. Because such a path cannot be optimal, aggregate savings must be strictly positive in $t = 0$: $\widehat{K}_1 > \widehat{K}_0$.*

Suppose now that $\widehat{K}_t > \widehat{K}_{t-1}$ and $\widehat{K}_{t+1} \leq \widehat{K}_t$ with $t > 0$. Using the same arguments as above, we have $r_{t+1}^L > r_t^L$. Then, by equation (18'), $\widehat{H}_{t+1} > \widehat{H}_t$. Further, equation (18) implies that $\widehat{K}_{t+2} < \widehat{K}_{t+1} \leq \widehat{K}_t$. But then, r_{t+2}^L must be strictly higher than r_{t+1}^L and, according to equation (17), $\widehat{H}$ must rise again between $t+1$ and $t+2$ so that $\widehat{K}_{t+3} < \widehat{K}_{t+2}$, and so on. Again, such a path cannot be optimal, and we conclude that $\widehat{K}_{t+1} > \widehat{K}_t$, $t \geq 0$. ■

Lemma (3) states that the individuals' optimal consumption decisions will never give rise to negative aggregate savings. The intuition is the same as in the first-best economy. Negative aggregate savings in t are associated with a higher return to capital in $t+1$. Since the Euler equation determines the extent of consumption growth, aggregate consumption will expand strongly between the two periods so that aggregate savings are even lower in $t+1$. This, in turn, leads to a strong expansion of consumption between $t+1$ and $t+2$, and so on. Eventually, the economy would collapse if the individuals followed such a consumption path.

So far, we know that even with an imperfect credit market the aggregate capital stock monotonically increases (Lemma 3) but may never exceed $\widehat{K}^*$ (Proposition 1). Suppose now that $\widehat{K}$ does not converge to $\widehat{K}^*$ but to a level that lies strictly *below* $\widehat{K}^*$. Then, by equation (7), we have $1 + r_t^E > 1 + r^* = (1+\rho)(1+g)$ for all $t \geq 0$. Consequently, since

$$\widehat{K}_{t+1}^E = \frac{1 + r_t^E}{(1+\rho)(1+g).} \widehat{K}_t^E,$$

it must be the case that $\widehat{K}^E$ grows towards infinity. This, in turn, requires $\widehat{K}^L$ to become negative from some point in time onwards which is impossible since the workers may not borrow.[17] Hence, the sequence $\left\{\widehat{K}_t\right\}_{t \geq 0}$ must converge to $\widehat{K}^*$. Then, by the equations (18) and (15), we have $\lim_{t\to\infty} \widehat{H}_t = \frac{1+\rho}{\rho}\widehat{w}^* = \widehat{H}^*$ and $\lim_{t\to\infty} \widehat{C}_t = \widehat{C}^*$, respectively. To summarize (proof in the text),

[17]Note, however, that even if the workers were allowed to borrow, $\widehat{K}$ could not converge to a value below $\widehat{K}^*$. The reason is that $\widehat{C}$ would grow towards infinity.

Proposition 5 *Let* $\lambda < \kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$*. Then, the sequences* $\left\{\widehat{K}_t\right\}_{t\geq 0}$ *and* $\left\{\widehat{C}_t\right\}_{t\geq 0}$ *converge to their first-best steady state values* $\widehat{K}^*$ *and* $\widehat{C}^*$*.*

It remains to determine the limit behaviour of κ_t. Obviously, this ratio may not converge to a value on the interval $(\lambda, 1]$ since then the entrepreneurs' rate of return would converge to a level that is strictly higher than $r^* = (1+\rho)(1+g) - 1$. Again, the entrepreneurs' stock of capital would grow towards infinity under such circumstances. Note further that κ_t does not converge to a value on the interval $[0, \lambda)$ either. Proposition (3) states that - whenever κ lies below λ - it has to exceed λ in the future. The following proposition states that κ_t exactly converges to λ.

Proposition 6 *Let* $\lambda < \kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$*. Then, the sequence* $\{\kappa_t\}_{t\geq 0}$ *converges to* λ*.*

Proof. *By the Bolzano-Weierstrass Theorem, the sequence* $\{\kappa_t\}_{t\geq 0}$ *has a convergent subsequence. We start the proof by showing that any convergent subsequence of* $\{\kappa_t\}_{t\geq 0}$ *has to converge to* λ*. Notice first that one can rule out that a subsequence converges to a value on the interval* $(\lambda, 1]$ *based on the same argumentation as above. Suppose now that there exists a subsequence* $\left\{\kappa_{t_j}\right\}_{j\geq 0}$ *that converges to a value on the interval* $[0, \lambda)$*, i.e., suppose without loss of generality that* $\lim_{j\to\infty} \kappa_{t_j} = \lambda - \varsigma$ *with* $\varsigma > 0$*. Then, there must be a* $\eta \in (0, \varsigma)$ *so that there exists a* $\widetilde{j}$ *with* $\left|\lambda - \kappa_{t_j}\right| > \eta$ *for all* $j \geq \widetilde{j}$*. Consequently, by Proposition 3, we know that* κ *has to increase infinitely often by an amount larger than* $\eta > 0$ *so that, since both* $\widehat{K}^E$ *and* $\widehat{K}$ *monotonically rise over time,* $\widehat{K}$ *must grow towards infinity. But this contradicts Proposition 5. We conclude that any convergent subsequence of* $\{\kappa_t\}_{t\geq 0}$ *converges to* λ*.*

Suppose now that the sequence $\{\kappa_t\}_{t\geq 0}$ *does not converge to* λ*. Then, there must be a* $\varepsilon > 0$ *so that for all* t *there exists a* $m(t) \geq t$ *with* $\left|\lambda - \kappa_{m(t)}\right| \geq \varepsilon$*. Consider the sequence* $\left\{\kappa_{m(t)}\right\}_{t\geq 0}$*. This sequence is also contained in the closed and bounded interval* $[0, 1]$*, and hence must have a convergent subsequence. This convergent subsequence, since it is also a subsequence of* $\{\kappa_t\}_{t\geq 0}$*, must converge to* λ*. But this contradicts the inequality* $\left|\lambda - \kappa_{m(t)}\right| \geq \varepsilon$*. Therefore, we have* $\lim_{t\to\infty} \kappa_t = \lambda$*.* ■

While the credit market imperfection does not prevent the aggregate variables to converge to their corresponding first-best values, poor creditor protection has a large impact on the long-run distribution of aggregate wealth, income, and consumption. The second result can easily be understood from the discussion in Subsection (4.2). The less the lenders are protected from expropriation, the lower the incentives to save and, as a consequence, the smaller the fraction of aggregate wealth they eventually own. But why does the aggregate capital stock converge to its first-best level? Clearly, it may never exceed the first-best economy's steady state value because, for a given capital stock, aggregate savings are lower with imperfect creditor protection. On the other hand, only convergence to the first-best level makes sure that, eventually, the Euler equation induces aggregate consumption to grow pari passu with productivity so that the optimal consumption rules can be applied ad infinitum. Hence, the aggregate capital stock grows towards $\widehat{K}^*$ also with $\lambda < \kappa^{*1}\left(\widehat{K}_0, \kappa_0\right)$, yet at a slower pace.

4.4 Simulation

We now calibrate the model in order to assess the quantitative implications of imperfect credit. In particular, we are interested in the welfare gains of the oligarchic elite.

The baseline model is calibrated as follows. The parameters take the usual values, namely $\alpha = 0.33$, $\rho = 0.05$, and $g = 0.03$. This choice implies steady state values of the capital stock (divided by the index of the state of technology) and the interest rate of $\widehat{K}^* = 8.06$ and $r^* = 0.0815$, respectively. Since we are interested in policy making in relatively poor countries, we choose a low initial aggregate capital endowment: $\widehat{K}_0 = 0.5$. With respect to the initial distribution of income we assume that the workers own 20 % of the initial capital stock (κ_0) and represent 95 % of the population ($\theta = 0.95$). Under the premise that there is no inequality within the two classes, these assumptions give rise to an income-based Gini coefficient (in $t = 0$) of 0.215. Of course, the Gini would be (considerably) higher if we assumed also within-class inequality. However, as far as the dynamics of the aggregate variables is concerned, within-class inequality does not play a role and we simply abstract from this issue.

Figure 6 shows the behavior of κ in the benchmark economy ($\lambda = 1$) and under imperfect credit, namely in case of $\lambda = 0.5$ and $\lambda = 0.2$. The steady state value of κ under perfect credit, κ^{*1}, can be numerically computed as 0.71. As shown above, the corresponding values under imperfect credit are given by $\kappa^{*0.5} = 0.5$ and $\kappa^{*0.2} = 0.2$, respectively.

Figure 6 here

It is clear from Proposition (4) that a representative entrepreneur's utility must be higher under imperfect credit. Moreover, when we look at Figure 2, it comes not as a surprise that the increase in utility is higher in the $\lambda = 0.2$-case. Numerical computation shows that the entrepreneurs experience a 20 %-increase in utility if $\lambda = 0.5$ and an increase of 48 % if $\lambda = 0.2$ (as compared to the benchmark case). This monotonicity seems not to depend on the initial conditions chosen here. In all the calibrations we have done the entrepreneurs' utility decreases in λ.

In all the calculations so far we assumed that A grows with 3 % irrespective of whether the economy is perfect or not. However, there are good reasons to believe that the imperfect economy - suffering from poor creditor protection and barriers to entry - grows at a lower rate. One reason might be talent mismatch. If the property rights on firms (and also the management) are passed down from generations to generation and if there are substantial barriers to entry there is little hope that the firms operating in this sector are managed by the most talented. But this type of dynastic management is particularly widespread in poorer economies with a bad contractual infrastructure (e.g., Caselli and Gennaioli, 2002). We are now interested in whether the capitalists will still lobby in favor of entry barriers and poor creditor protection if this policy mix leads to a lower growth rate. More precisely, we ask how much growth the capitalists are willing to sacrifice in order to have a λ of 0.5 or 0.2. To avoid a time-consistency problem it is simply assumed that the policy mix is determined in $t = 0$ once and for all. Numerical computation shows that the entrepreneurs would accept a decrease in the growth rate of A of up to 1.8 percentage points in order to have $\lambda = 0.5$. The corresponding number for $\lambda = 0.2$ is 4.6 percentage points. So, the capitalists prefer to live in an economy with zero or even negative long-run growth if the income distribution changes significantly in their favor during the transition towards the steady state.

5 Conclusions

This paper introduces imperfect credit contract enforcement and a restriction on occupational choice into the standard Ramsey growth model. In particular, it is assumed that only a small economic elite, the oligarchs, may undertake significant capital investments and that these members of the elite, when borrowing from the rest of the society, may renege on the debt contracts at low cost. We show that in such an oligarchic society poor contract enforcement slows down the transition towards the steady state and alters the dynamics of the asset distribution strongly in favor of the established entrepreneurs.

The reason is that the non-entrepreneurs, lacking an alternative use for their savings, are forced to charge "low" borrowing rates in order to give the incumbents weaker incentives to default. With dynastic preferences, low returns to accumulation deteriorate the non-entrepreneurs', i.e., the workers', incentives to save. They discount their future labor income less and, as a consequence, consume more out of current income. Moreover, their current (capital) income is, other things equal, smaller which reinforces the effect operating via the present value of future wages. Access to cheap credit, in turn, is associated with a "high" entrepreneurial rate of return. Even though the oligarchs are induced to save more through this channel, the net effect of poor creditor protection on aggregate savings is negative.

The present paper goes beyond the existing literature in two respects. First, it analyzes the impact of an imperfect credit market on aggregate accumulation and the dynamics of the distribution when individuals have dynastic preferences; it describes a mechanism that is by construction absent if parents derive utility directly from bequeathing to their children or if the interest rate is exogenous. Second, the paper emphasizes that poor creditor protection - although detrimental to financial development and growth - produces winners if there are significant barriers to entrepreneurship. Calibrations of the model suggest that the elite's welfare gains are substantial; a representative oligarch would not only be willing to accept a slower transition to the steady state but also significantly lower productivity growth rates in exchange for poor creditor protection and barriers to entrepreneurship.

The existence of asymmetric distributional consequences suggests that there may be political forces behind low financial development. Perhaps, creditor protection is bad neither because a poor country cannot afford better contract enforcement nor because it is ignored that contract enforcement is important; the reason may simply be that it is not in the interest of the politically powerful to have a better working credit market. We find some empirical evidence pointing into this direction. Creditor protection is particularly bad when there are substantial barriers to entrepreneurship and, as a result, the model predicts strong distributive consequences.

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Tables

***Table* 1 – Summary Statistics**

	Number of observations	Mean	Standard Deviation	Minimum	Maximum	Best Rating
PROPERTY_RIGHTS	84	3.58	1.02	1	5	5
DAYS	84	348.86	221.65	27	1390	-
PRIVATE_CREDIT	84	49.40	41.07	3.83	186.72	-
LN_#PROC (procedures)	85	2.24 (10.49)	0.51 (4.37)	0.69 (2)	3.04 (21)	-
LN_COST (cost)	84	-0.94 (0.65)	1.09 (0.83)	-4.08 (0.02)	1.60 (4.95)	
BUSINESS_REG	81	3.09	0.87	1	5	1
LN_pcGDP (pcGDP)	85	7.95 (8226.35)	1.64 (10431.68)	5.25 (190)	10.55 (38350)	-

Sources: PROPERTY_RIGHTS: Heritage Foundation, 1999; DAYS: Djankov et al. (2004); PRIVATE_CREDIT: World Development Indicators, 2001; LN_#PROC, LN_COST and LN_pcGDP: Djankov et al. (2002); BUSINESS_REG: Heritage Foundation, 1997 (Secondary Source: La Porta et al., 2002)

***Table* 2 – Regression Results**

	Dependent Variables											
	PROPERTY_RIGHTS						DAYS					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
LN_#PROC	-0.43[a] (0.11)	-0.43[b] (0.17)					121.7[b] (62.2)	106.4 (82.8)				
LN_COST			-0.18[a] (0.06)	-0.18[b] (0.08)					89.1[a] (26.0)	94.9[a] (30.8)		
BUSINESS_REG					-0.36[a] (0.11)	-0.34[a] (0.11)					75.2[b] (30.7)	94.84[b] (37.6)
LN_pcGDP	0.44[a] (0.04)	0.38[a] (0.05)	0.43[a] (0.05)	0.37[a] (0.06)	0.36[a] (0.06)	0.30[a] (0.06)	-10.1 (21.2)	5.6 (28.3)	8.5 (21.9)	31.4 (28.4)	0.62 (22.2)	30.0 (30.4)
Constant	0.99[c] (0.53)	1.67[a] (0.64)	-0.07 (0.38)	0.69[c] (0.41)	1.87[b] (0.74)	2.43[a] (0.74)	155.8 (285.1)	57.4 (356.9)	364.4[b] (140.7)	190.9 (185.5)	109.6 (248.5)	-210.4 (332.2)
Dummies for legal origin	no	yes	no	yes	no	yes	no	yes	no	yes	no	yes
No. of obs.	84	84	83	83	80	80	84	84	83	83	80	80

Robust standard errors in parentheses.
[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.
[c] Significant at the 10 percent level.

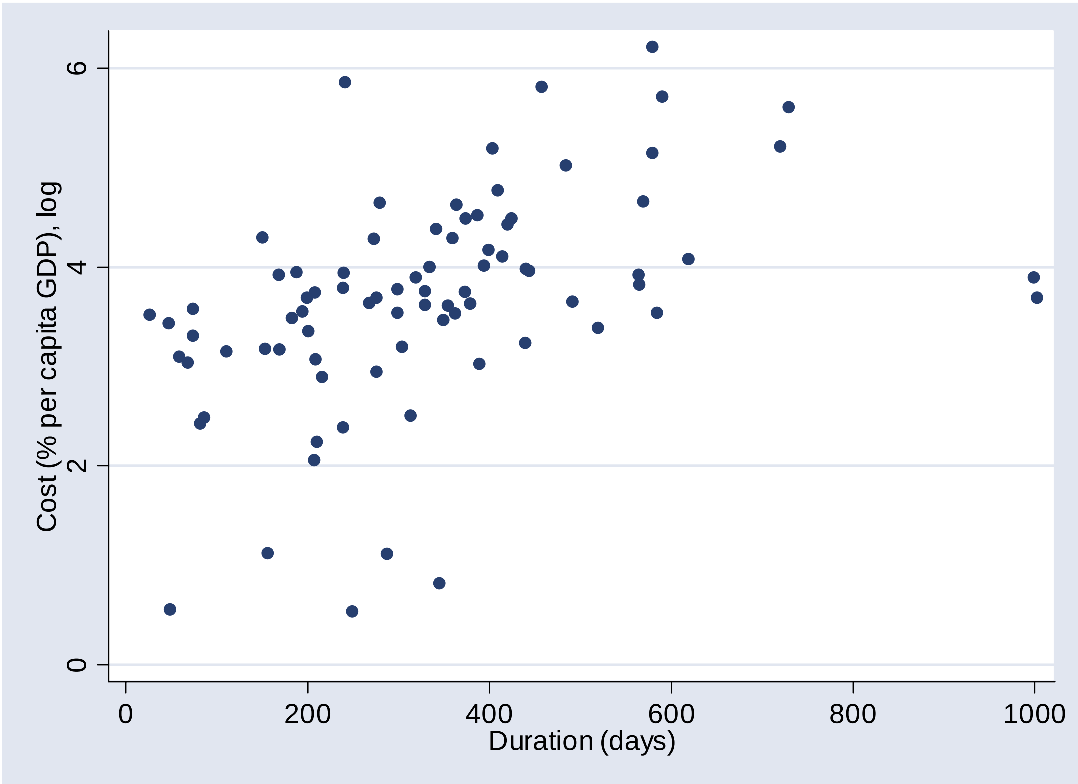
***Table* 2 – Regression Results** (continued)

	Dependent Variable					
	PRIVATE_CREDIT					
	(13)	(14)	(15)	(16)	(17)	(18)
LN_#PROC	-5.24 (6.45)	1.89 (8.04)				
LN_COST			-4.67[c] (2.79)	-4.54[c] (2.65)		
BUSINESS_REG					-11.28[b] (5.04)	-10.32[b] (4.25)
LN_pcGDP	16.63[a] (2.26)	15.22[a] (2.52)	15.53[a] (2.52)	12.98[a] (2.14)	13.30[a] (2.59)	10.86[a] (1.97)
Constant	-70.75[a] (26.73)	-61.76[b] (25.57)	-78.17[a] (17.51)	-47.596[a] (13.98)	-20.74 (32.67)	4.81 (27.33)
Dummies for legal origin	no	yes	no	yes	no	yes
No. of obs.	84	84	83	83	80	80

Robust standard errors in parentheses.
[a] Significant at the 1 percent level.
[b] Significant at the 5 percent level.
[c] Significant at the 10 percent level.

Figures

***Figure* 1 – Contract enforcement in courts and entry regulation**



Sources: Number of days to enforce a simple debt contract in court: Djankov et al. (2004); Cost (in logs) as a share of per capita GDP to open a small business: Djankov et al. (2002)

***Figure* 2 – Entrepreneur *i*'s optimal firm size**

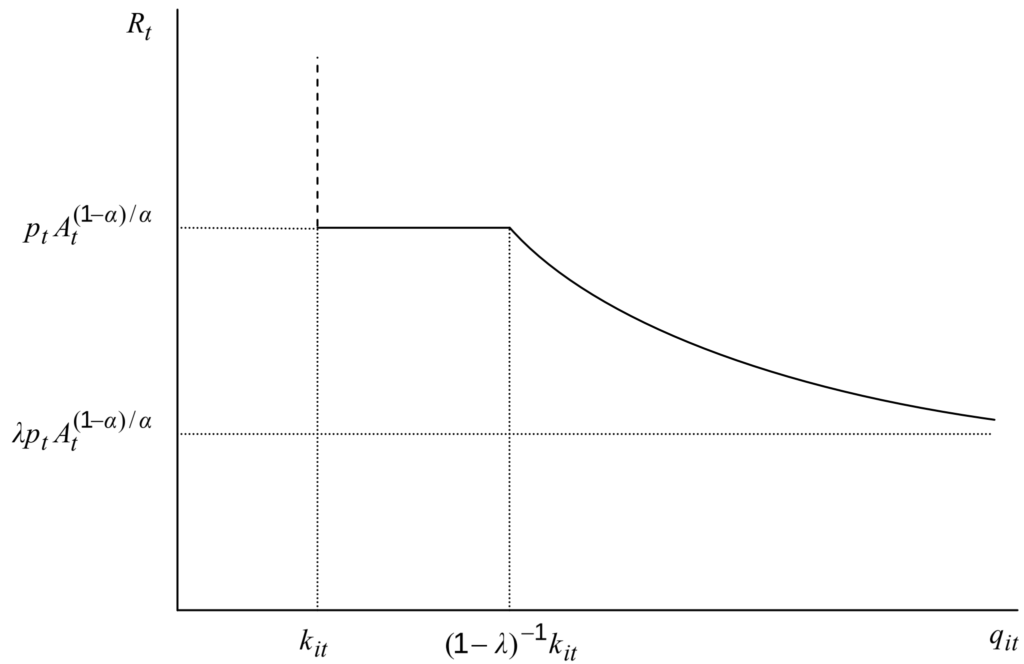
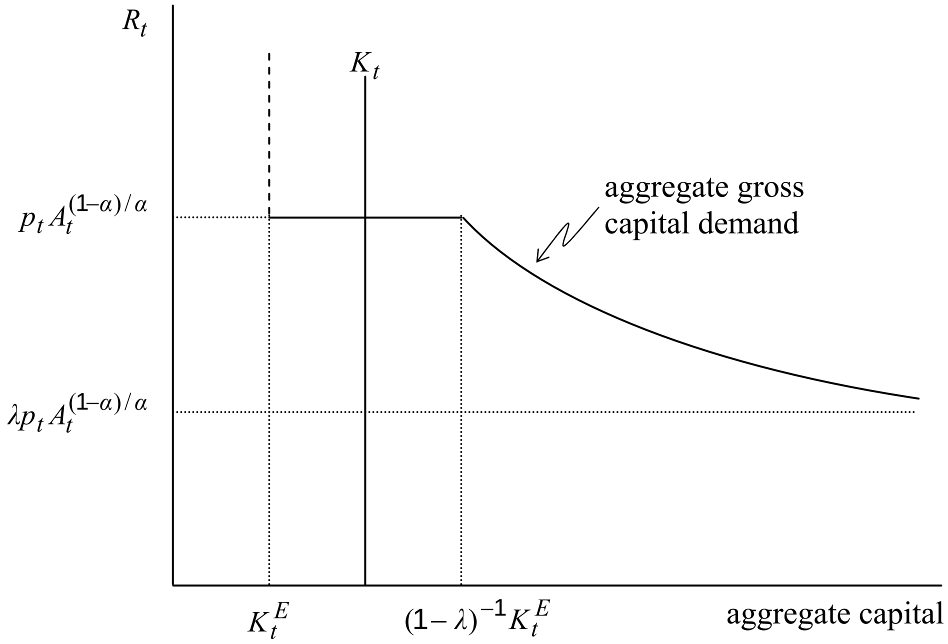


***Figure* 3 – Credit market equilibrium**

a. Low κ



b. High κ

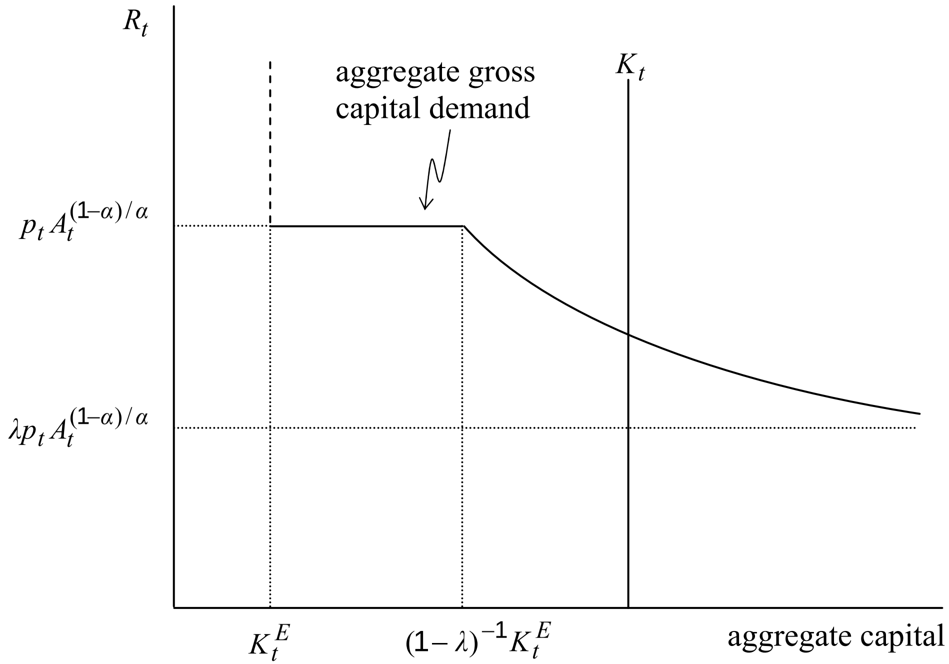


***Figure* 4 – Dynamics of *κ* with a perfect credit market**

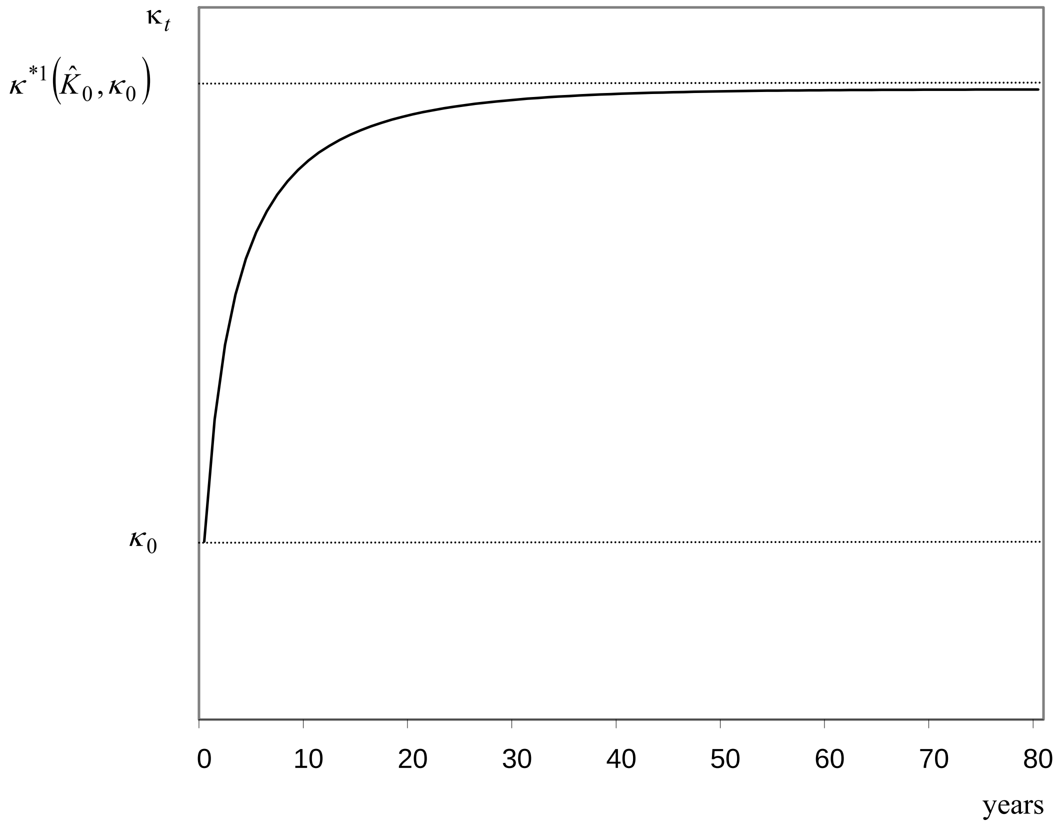


***Figure* 5 – Two cases**

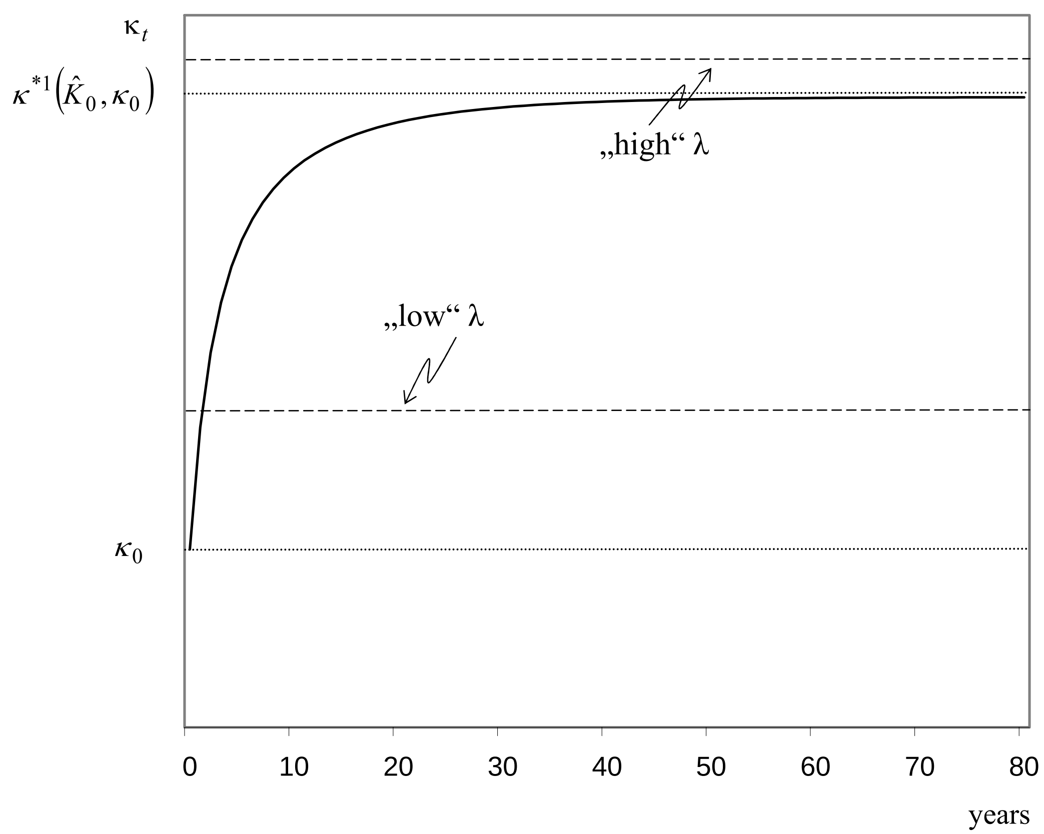


***Figure* 6 – Dynamics of κ with different λ's**